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SDavis
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EXPEDITED PROCEDURE
GROUP ART UNIT 2853

00862.021966

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	:	Examiner: B. Mouttet
NORIHIRO KAWATOKO, ET AL.	)	
	:	Group Art Unit: 2853
Appln. No.: 09/628,661	)	
	:	
Filed: July 28, 2000	)	
	:	
For: PRINTING APPARATUS, CONTROL	)	
METHOD OF THE APPARATUS,	:	
AND COMPUTER-READABLE	)	
MEMORY	:	October 21, 2003

Commissioner for Patents
MAIL STOP AF
P.O. Box 1450
Alexandria, VA 22313-1450

TECHNOLOGY CENTER 2800 OCT 24 2003 RECEIVED

REQUEST FOR RECONSIDERATION

Sir:

In response to the Official Action mailed July 21, 2003, Applicants

respectfully request reconsideration and allowance in view of the following remarks.

Claims 1-41 remain pending in the application, with Claims 1, 12 and 23

being independent.

Claims 1-3, 7, 11-14, 18, 22-27, 29-32 and 34-41 were rejected under

35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,497,174 (Stephany et al.) in

view of U.S. Patent No. 6,189,993 (Mantell). Claims 6 and 17 were rejected under § 103

as being unpatentable over Stephany et al. in view of Mantell and further in view of U.S.

Patent No. 6,183,056 (Corrigan et al.). Claims 4, 5, 10, 15, 16 and 21 were rejected under

§ 103 as being unpatentable over Stephany et al. in view of Mantell and further in view of

European Patent Application No. 0 626 266 (Nagoshi et al.). Claims 8 and 19 were

rejected under § 103 as being unpatentable over Stephany et al. in view of Mantell and

further in view of U.S. Patent No. 5,223,853 (Wysocki et al.). Claims 9 and 20 were

rejected under § 103 as being unpatentable over Stephany et al. in view of Mantell and

further in view of U.S. Patent No. 5,289,207 (Ebisawa). Claims 28 and 33 were rejected

under § 103 as being unpatentable over Stephany et al. in view of Mantell and further in

view of U.S. Patent No. 5,610,638 (Courtney). These rejections are respectfully traversed.

As is recited in independent Claim 1, the present invention relates to a

printing apparatus for performing printing by using a printhead having a plurality of

printing elements. The apparatus includes determining means, counting means and control

means. The determining means determines a fundamental pulse shape on the basis of a

driving condition according to a condition of the printhead in a period other than a printing

period. The counting means counts the number of simultaneously driven printing elements

of the plurality of printing elements in the printing period. The control means controls a

driving pulse to be applied to printing elements used in the printing of the printing data.

The driving pulse is a pulse generated in the printing period by correcting the fundamental

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pulse shape determined by the determining means on the basis of the number of simultaneously driven printing elements counted by the counting means.

As is recited in independent Claim 12, the present invention relates to a method of controlling a printing apparatus for performing printing by using a printhead having a plurality of printing elements. The method includes a determination step of determining a fundamental pulse shape on the basis of a driving condition according to a condition of the printhead in a period other than a printing period, a counting step of counting the number of simultaneously driven printing elements of the plurality of printing elements in the printing period, and a control step of controlling a driving pulse to be applied to printing elements used in the printing of the printing data. The driving pulse is a pulse generated in the printing period by correcting the fundamental pulse shape determined in the determination step on the basis of the number of simultaneously driven printing elements counted in the counting step.

As is recited in independent Claim 23, the present invention relates to a computer-readable memory storing program codes of control of a printing apparatus for performing printing by using a printhead having a plurality of printing elements. The memory includes a program code of a determination step of determining a fundamental pulse shape on the basis of a driving condition according to a condition of the printhead in a period other than a printing period, a program code of a counting step of counting the number of simultaneously driven printing elements of the plurality of printing elements in the printing period, and a program code of a control step of controlling a driving pulse to be applied to printing elements used in the printing of the printing data. The driving pulse

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is a pulse generated in a printing period by correcting the fundamental pulse shape determined in the determination step on the basis of the number of simultaneously driven printing elements counted in the counting step.

In the field of ink jet printing, as described in the "Background of the Invention" section of the specification, driving pulse control of an ink jet printhead has been utilized to improve discharge stability on the basis of unique characteristics (including ink discharge amount, ink discharge speed or the like) of the printhead. Further, a driving pulse control of an ink jet printhead has also been utilized for improving heater durability on the basis of the number of simultaneously driven print elements of the printhead.

In order to increase performance of an ink jet printing apparatus, the present invention incorporates the foregoing two types of driving pulse control. However, simply incorporating the two driving pulse control types into a printing apparatus will not necessarily increase its performance, but rather the particular usage of the control types must be considered. Such usage is an important aspect of the present invention.

More particularly, in the claimed invention, a first driving pulse control (determining a fundamental pulse shape) that can improve discharge stability and a second driving pulse control (correcting the fundamental pulse shape) that can enhance heater durability are performed separately at different timings. Namely, the first driving pulse control is executed according to a condition of the printhead in a period other than a printing period. Thus, the first driving pulse control can be performed in a period where a time margin is sufficient (e.g., before the printing period) because of the condition of the printhead (e.g., its temperature) is changed slowly. On the other hand, the second driving

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pulse control generates a pulse in the printing period on the basis of a number of simultaneously driven printing elements because the number of simultaneously driven printing elements are changed in a very short time cycle (e.g., 10 μsecs).

Therefore, the present invention can achieve the benefits of the above-described two types of driving pulse control while enhancing the performance of the printer.

The ink jet printer of Stephany et al. sets a driving pulse width by look-up tables contained in ROM1 46. As described previously, in one embodiment (Fig. 4), three parameters are input into ROM1 46 to determine the pulse width. These parameters include a two-bit word from ROM2 44 representing the number of heater elements to be fired, the count of counter 56 representing the relative position on the printhead of the heater elements to be fired, and printhead temperature from thermistor 60. Furthermore, the look-up tables in ROM1 46 are reflective of a particular combination of printing conditions, such as desired spot size, a particular type of ink, and a particular type of copy sheet.

As recognized by the Examiner, Stephany et al. does not disclose or suggest that a fundamental pulse width is set in a period other than a printing period. Moreover, contrary to the Examiner's interpretation, the ROM1 46 of Stephany et al. does not determine a fundamental pulse shape or pulse width on the basis of driving conditions including desired spot size, ink type and copy sheet type. Rather, these conditions are used to identify one of numerous look-up tables available to the user from ROM1 46. There is no disclosure or suggestion in Stephany et al. that the information in the selected look-up

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table defines a fundamental pulse shape and that the applied driving pulse is a pulse generated by correcting the fundamental pulse shape. Rather, in Stephany et al., based on the number of heating elements to be fired, the position of the heater elements to be fired and a temperature of the printhead, an address is selected from a look-up table in ROM1 46 and that address contains a coded pulse width to be applied to the heater elements.

Thus, Stephany et al. fails to disclose or suggest determining a fundamental pulse shape on the basis of a driving condition according to the condition of the printhead in a period other than a printing period, counting the number of simultaneously driven printing elements of the plurality of printing elements in the printing period, and controlling a driving pulse, with the driving pulse being a pulse generated in the printing period by correcting the fundamental pulse shape on the basis of the number of simultaneously driven printing elements, as is recited in independent Claims 1, 12 and 23.

Thus, Stephany et al. fails to disclose or suggest important features of the present invention recited in the independent claims.

Mantell describes an ink jet printer for printing images having different grayscales. A user can select from one of a plurality of print quality modes and one of a plurality of media types. While presumably the printing mode and print media are selected in Mantell prior to a printing period, Mantell merely discloses a user interface for enabling selection of print qualities and media types. As understood by Applicants, these printing conditions merely define a printing method and do not define a condition of a printhead for determining a fundamental pulse of the printhead. Mantell fails to disclose or suggest executing separately, one in a period other than a printing period and the other in the

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printing period, determining a fundamental pulse shape on the basis of a driving condition

and generating a pulse by correcting the fundamental pulse shape on the basis of a number

of simultaneously driven printing elements, as is recited in the independent claims.

At most, the proposed combination of Stephany et al. and Mantell,

assuming, arguendo, that the two citations could be combined, would result in that the

desired spot size, type of ink and type of copy sheet in Stephany et al. be selected by a user

beforehand. This differs significantly from determining a fundamental pulse shape on the

basis of a driving condition according to a condition of the printhead.

Thus, Mantell fails to remedy the deficiencies of Stephany et al. noted

above with respect to the independent claims.

The remaining citations have been reviewed, but are not believed to remedy

the deficiencies of Stephany et al. and Mantell noted above with respect to the independent

claims.

Thus, independent Claims 1, 12 and 23 are patentable over the citations of

record. Reconsideration and withdrawal of the § 103 rejections are respectfully requested.

For the foregoing reasons, Applicants respectfully submit that the present

invention is patentably defined by independent Claims 1, 12 and 23. Dependent Claims 2-

11, 13-22 and 24-41 are also allowable, in their own right, for defining features of the

present invention in addition to those recited in their respective independent claims.

For example, with regard to Claims 2 and 13, the Examiner suggests that the

driving conditions in Stephany et al. include environmental temperature. While in the

embodiment of Fig. 4 temperature is one of the parameters input into ROM1 46,

temperature is not one of the conditions used by a user to select a look-up table, which conditions were noted by the Examiner to correspond to the condition of the printhead recited in the claims.

Individual consideration of the dependent claims is requested.

Applicants submit that the present application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

Attorney for Applicants

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